

REMARKS

Claims 1-19 are in the case.

The claims have been made subject to a requirement to restrict. A provisional election was made by telephone to elect claims 1-3 and 11-19 (group I), without traverse. Applicants hereby affirm this election. Claims 4-10 are withdrawn from consideration and not canceled to preserve the right of rejoinder.

The claims are non-finally rejected under 35 USC § 103.

Claims 1, 11, 12, 13, and 14 have been amended to more clearly describe applicants' invention

Claims 16-18 have been canceled.

No new matter has been added

Rejections Under 35 U.S.C. §103(a)

a. Claims 1-3 and 11-14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Papadimitrakopoulos (U.S. Patent No. 7,131,537; hereinafter "Papadimitrakopoulos") in view of Dai et al. (WO 02/095099; hereinafter "Dai reference") and in view of Rakestraw (U.S. Patent No. 5,595,876; hereinafter "Rakestraw").

The application claims joint inventors. The examiner presumes that the subject matter of the claims was commonly owned at the time any inventions were made. The examiner's presumption is correct.

Papadimitrakopoulos teach the separation of carbon nanotubes (CNT) by size or type using a gel permeation chromatography. Papadimitrakopoulos suggests that electrophoresis may also be used for separation of CNT.

Dai teaches the functionalization of CNT for immobilization on surfaces. Dai does not suggest or teach the methods for the separation of CNT.

Rakestraw teaches the separation of nucleic acids by gel electrophoresis. Rakestraw does not teach the separation of CNT by any method.

The examiner argues that the skilled person would find the invention obvious by combining the suggestions of Papadimitrakopoulos with respect to separation of CNT by electrophoresis with the teachings of Dai that DNA can be bound to CNT and those of Rakestraw teaching that DNA may be separated by electrophoresis. Applicants respectfully traverse.

It is well settled that in order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. [MPEP2143]

Applicants submit that the combination of the cited references does not support a *prima facie* case of obviousness because the references do not contain all the limitations of the claims and, as such, the skilled person would have no motivation to combine these references and would have no reasonable expectation of success in combining the references to attain the invention as claimed.

The limitation of and unfunctionalized CNT is not taught. Claim 1 recites the limitation that the CNT is unfunctionalized and is associated with a nucleic acid. This is limitation that is taught in none of the references. Rakestraw does not mention CNT. Dai specifically teaches functionalized CNT (see abstract and throughout). Papadimitrakopoulos teaches functionalized CNT (See col. 3, line 46). None of the references teach the starting material for separation as claims in the present invention.

The use of electrophoresis to separate CNT is not taught. Claim 1 recites the limitation that the complex of CNT and DNA is separated by gel electrophoresis by applying an electric field. The examiner suggests Papadimitrakopoulos teaches this element. Applicants respectfully assert Papadimitrakopoulos' mention of electrophoresis in Col 4 does not constitute an enabling disclosure. Papadimitrakopoulos does not discuss the use of an electric field, provides no evidence that such a separation could take place and clearly does not suggest if such a separation would be effective with respect to applicants DNA wrapped CNT complexes. Applicants submit that Papadimitrakopoulos does not teach electrophoresis for separation of CNT, generally and does not teach the method for the separation of the DNA – CNT complexes of the present invention.

There is no motivation to combine the references. The examiner suggests that the teaching of Rakestraw that nucleic acids may be separated by electrophoresis on the basis of size links the teachings of Papadimitrakopoulos and Dai. Applicants disagree. The teaching of Rakestraw is limited to separation of nucleic acids on the basis of size. The present invention does not implicate DNA in the separation. Nucleic acids of the invention are used principally as dispersants. It is notable that the CNT of the invention are separated on the basis of the diameter of the tubes. The presence of the DNA is not a factor in the separation. Claim 1 has been amended to reflect that the CNT are separated on the basis of diameter. Basis for this amendment is found in example 9, beginning on page 22 of the specification. It is *a priori* unpredictable that a separation on the basis of diameter could be effected based on the teachings of Dai, Rakestraw and Papadimitrakopoulos, and therefore there is no motivation provided to the skilled person to combine the cited references to derive the present invention.

b. Claims 15-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Papadimitrakopoulos, Dai et al. and Rakestraw references in view of Awano et al. (U.S. Patent Application Publication No. US 2003/0124717; hereinafter "Awano").

The teachings of Papadimitrakopoulos, Dai and Rakestraw are given above.

Awano teaches chemical vapor deposition of CNT by a method involving the implantation of metal ions in the surface on which the CNT are to be grown. Awano teaches that CNT having a uniform diameter and chirality are known. Awano does not teach a complex of CNT associated with nucleic acids and do not teach methods for the separation of CNT's.

The invention of Claims 15-18 is drawn to the separation of CNT by gel electrophoresis where the separated CNT have uniform diameter, chirality and semiconducting properties.

Claims 16-18 have been canceled. Thus the discussion here is limited to the subject matter of claim 15, CNT having a uniform diameter.

The examiner argues that the skilled person, knowing that CNT of uniform diameter are known as taught by Awano, would expect their separation by the methods of Papadimitrakopoulos, Dai and Rakestraw. Applicants traverse.

As noted above, the combination of Papadimitrakopoulos, Dai and Rakestraw do not support a *prima facie* case of obviousness under 35 USC § 103 as the combination of these references does not teach all the elements of the claimed invention and does not allow for the unexpected results of separation of CNT on the basis of diameter. The introduction of Awano does not remedy the deficiencies of the other three references. The fact that populations of CNT having a uniform diameter are known does not provide any nexus with Papadimitrakopoulos, Dai and Rakestraw to teach the skilled person that such a population could be separated by the claimed invention.

c. Claims 17 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Papadimitrakopoulos, Dai., Rakestraw and Awano et al. references in view of Rinzler et al. (U.S. Patent Application Publication No. US 2004/0197546; hereinafter "Rinzler").

The teachings of Papadimitrakopoulos, Dai., Rakestraw and Awano have been given above.

Rinzler teaches the construction of CNT films from single walled carbon nanotubes which are optically active and electrically conductive. Rinzler teaches that metallic CNT are known. Rinzler does not teach the CNT – DNA complex of the invention nor does she teach methods for the separation of CNT.

Claim 17 has been canceled. The invention of Claim 19 is drawn to CNT that are metallized, i.e coated with a metal. (See page 18 beginning at line 1 for example)

The examiner argues that the skilled person, knowing that CNT having metallic properties are known as taught by Rinzler, would expect their separation by the methods of Papadimitrakopoulos, Dai and Rakestraw. Applicants traverse.

Applicants note that Rinzler does not teach the element supported by Claim 19. Rinzler (paragraph 0006) teach that CNT are known to have metallic (as opposed to semiconducting) properties. This is vastly different than teaching that the CNT is coated with a metal as claimed in the present invention. As argued above, the combination of Papadimitrakopoulos, Dai and Rakestraw do not support a *prima facie* case of obviousness under 35 USC § 103 as the combination of these references does not teach all the elements of the claimed invention and does not allow for the unexpected results of separation of CNT on the basis of diameter. The introduction of Rinzler does not remedy the deficiencies of the other three references and in fact introduces an element unrelated to the invention – that of CNT having metallic properties.

In view of the arguments made herein and the amendments to the claims applicants respectfully request the withdrawal of all rejections and reconsideration of the claims.

Should the Examiner wish to discuss any issues involved in this application, the Examiner is respectfully invited to contact the undersigned at the telephone exchange set forth below. Should there be any fee due in connection with the filing of this Amendment, please charge such fee to Deposit Account No. 04-1928 (E. I. du Pont de Nemours and Company).

Respectfully submitted,

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